PATENT SPECIFICATION

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727,475

Date of filing Complete Specification Dec. 16, 1952.

Application Date Dec. 17, 1951. *No. 29541/51.*

Complete Specification Published April 6, 1955.

Index at acceptance:—Classes 28(1), B1; and 87(2), A1C, A1R(6D: 9).

COMPLETE SPECIFICATION

Improvements in or relating to the manufacture of Artificial Fruits Gelled Pharmaceutical products and the like

We, ALGINATE INDUSTRIES LIMITED, of Walter House, Bedford Street, Strand, London, W.C.2, a British Company, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention comprises improvements in or relating to the manufacture of artificial fruits, and gelled pharmaceutical products and the like.

It is known that certain edible colloidal solutions can be gelled by immersing them into a gelling agent, and that one example of this procedure is the preparation of artificial fruits such as cherries by introducing globules of the solution into the gelling agent. For example, solutions containing sodium alginate if introduced into a solution containing a soluble calcium salt can be superficially gelled into bodies resembling fruit and if properly flavoured and coloured are satisfactory substitutes. This procedure is fully described in British Patent Specifications Nos. 556,718 and 586,157. Again, if solutions containing sodium alginate and colloidal calcium phosphate prepared according to British Patent Applications Nos. 25411/50 and 25412/50 are introduced into a dilute acid used as a gelling agent similar results can be obtained. Hitherto, however, the usual method of operation has consisted in filling the viscous colloidal solution into moulds containing some of the gelling agent and subsequently immersing the filled mould in a bath of the gelling agent after which the moulded object is turned out of the mould into the bath. This method gives satisfactory results but to produce a continuous supply of gelled bodies needs a complicated mechanism to divide the solution into the separated quantities required in the moulds, on account of its viscosity and stickiness.

[*Price*

The present invention has for its object to produce gelled bodies from solutions which are capable of being gelled but are, in the liquid state not easily separated into discrete portions, such solutions are hereinafter called "solutions of the kind described".

According to the present invention a process of manufacturing gelled bodies from solutions of the kind described is characterised by maintaining a body of such solution on one face of a wall having in it an aperture, maintaining a bath of gelling liquid on the opposite face, so that a skin of gelled solution forms across the aperture, forcing the solution through the aperture to form a bag of the gelled skin which bulges into the gelling liquid and nipping off this bag while in the gelling liquid, when it has reached an appropriate size.

The nipping-off operation, being conducted beneath the surface of the coagulating liquid, results in the immediate reformation of a fresh skin across the aperture so that the operation can be readily and rapidly repeated.

The invention includes an apparatus for the production of articles of the kind referred to consisting of a container having an aperture or apertures through which the contents of the container may be forced, means to exert pressure on liquid in the container, a cutting-off knife or knives operating against the outside of the container over the aperture and a vessel to contain a bath of coagulating liquid and maintain it in contact with the knife and exterior of the aperture.

The following is a description by way of example of an apparatus in accordance with the invention and of the process according to the invention as carried out therein.

Referring to the accompanying drawing:—

Figure 1 is a diagrammatic representation with parts broken away to show the internal construction of one form of apparatus according to the invention.

Figure 2 shows the method of filling the apparatus and Figure 3 shows the process in operation, and

Figures 4 and 5 are details.

A cylindrical container 11 is provided supported on a separate stand 12 so that there is a free space beneath the bottom of the container. In the container is a piston 13 and through the container there passes from top to bottom coaxial with the container and piston a screw-threaded shaft 14. The piston fits on the screw-thread of the shaft, which is left handed, and a rib 15 is provided on the interior of the container 11 fitting a notch in the edge of the piston to prevent the piston from rotating if the shaft is rotated. Across the top of the container there is secured a yoke 16, which spans the container from side to side and supports a bearing 17 for the upper end of the screwed shaft 14. A handle 18 is fixed to the shaft above the bearing. The shaft goes through the bottom of the container and on the underside thereof carries a rotary cutting-off blade or blades 19.

The bottom 20 of the container is made removable and interchangeable with other bottoms, and the rotary knife blade or blades 19 are made removable from the shaft and secured by a wing-nut 21 to facilitate the changing of the bottom of the container.

The bottom of the container contains one or more apertures 22 (Figure 4) through which liquid from the interior of the container may be forced. The volume of the fruit-like bodies depends on the pitch of the thread on the shaft 14, the number of apertures 22 and the number of knives 19. By choosing an aperture of suitable area in relation to these three factors bodies approximating to spheres are produced.

The preparation of approximately spherical artificial fruits is described below as an example of the use of the apparatus:—

10 grams sodium alginate containing a chemical equivalent amount of colloidal calcium phosphate (as described in British Patent Application Nos. 25411/50 and 25412/50).
5 grams sodium alginate,
500 grams sugar,
315 grams neutral glucose syrup (80% solid),

are dissolved in 300 grams of water and the mixture boiled down to a total weight of 1000 grams. The best results are obtained when neutral calcium free glucose is used in the mix. Where the glucose is either acid or contains calcium, production is improved by the inclusion in the mix of a small quantity (say 3% of the sodium alginate) of tetra-sodium pyrophosphate. Suitable colour and flavour is added and the viscous liquid is then introduced into the container of the apparatus. This is done by first screwing back the piston 13 till it reaches the upper limit of its travel and then inverting the body 11 on the stand 12 in the manner shown in Figure 4. To permit the body to be supported in either the upright or the inverted position, it carries around it two circumferential external ribs 23, 24, either of which is adapted to rest on the upper surface of the stand 12 with part of the body projecting downwards through the aperture. The knives and the bottom 20 being removed it is easy to pour the liquid into the container 11.

Thereafter the bottom and the knives are replaced and the container quickly inverted and brought into the position shown in Figure 3 above a gelling bath 25 placed below the stand 12. The gelling bath into which the container is placed is a 10% solution of citric acid containing a small quantity (0.6%) of material sold under the Registered Trade Mark "Calgon" (glassy sodium metaphosphate of the type known as Graham's salt) to ensure that gelling is by acid only. The liquid in the container 11 does not immediately flow down into the gelling bath owing to its high viscosity and the formation by the gelling bath of a skin on the portion of the under-surface of the liquid which spans the apertures 22 in the perforated bottom plate 20.

The shaft 14 is now rotated by the handle 18 and the piston 13 thereby forced downwardly. This causes the skin which spans the apertures 22 to bow downwardly like a bag, and as the knives 19 rotate they cut off the bags hanging from the apertures 22 and close them to form completed fruits.

As the shaft 14 is rotated and fruits are cut off, as shown in Figure 3, the cutting-off blades 19 carry films of coagulating liquid across the undersides of the apertures and this is immediately followed up behind the blades by a body of the coagulating liquid. The effect is to form instantaneously a fresh skin of coagulated liquid across the aperture or apertures. As the shaft rotates the liquid behind each skin is forced downwards into the coagulating medium where the surface is again formed into a bag. If the size of the aperture is suitably

chosen in relation to the number of the apertures and the pitch of the screw-thread, and the number of knives, the bag will reach proportions in which it is somewhat deeper than a hemisphere by the next time a knife comes round. The front edge of each knife has an indented portion as shown at 26, Figure 5, so that as it crosses over an aperture 22 it nips the sides of the bag together towards the far side of the aperture. The result is that when the bag is finally cut off it is already very nearly spherical; the sides where they are cut off form a closed bag, and as the cut-off globule falls through the body of the coagulating liquid, the coagulated skin is thickened and it becomes substantially spherical. The rotation of the knife 19 produces a fresh fruit every time it crosses an aperture, and if the cylinder 11 has been charged with a suitable body of solution as described, the whole of this solution can be converted into fruits by screwing the shaft 14 around until the piston reaches the bottom of the container 11. Thereafter the piston 13 is returned to the top of the container again and the container 11 recharged.

As long as the globules remain in the gelling bath 25 the skin continues to thicken, the rate depending on the strength of the acid. The time for which they are left in the bath therefore depends on the thickness of skin desired. With a bath consisting of a 10% solution of citric acid about fifteen minutes immersion is sufficient. They have no tendency to stick together in this process and a quantity several layers deep can be accumulated in the bath. After sufficient gelling the fruits are then removed, rinsed briefly with water to remove adhering acid and spread out to dry.

If a solution such as described is made at its boiling point, that is to say 108° C. and introduced into this apparatus, the operation of producing artificial fruits could normally begin when the temperature of the solution has fallen to about 70° C. It is to be understood, however, that the operation can also be done in the cold. The liquid must be viscous enough to avoid an undue temporary amount of "run-through" before turning the handle.

It is to be understood that the use of the apparatus as disclosed is not confined to the gelling mixture and gelling bath described in the example. For instance when gelling with an acid the proportion of sodium alginate and insoluble calcium salt in the mixture to be gelled can be varied within wide limits. If a gelling bath containing a calcium salt adapted to gel sodium alginate is used, the mixture to be gelled will contain sodium alginate, but need not contain any calcium.

A solution of any edible acid can be used as an acid setting bath. Approximately normal acid gives good results but the concentration can be varied widely.

It is to be understood further that the use of the apparatus is not confined to the preparation of artificial fruits as described in the example. It can also be used for other preparations where a gelling mixture is gelled by contact with a suitable gelling bath. An example of another use is the preparation of gelled globules for pharmaceutical purposes.

It is within the scope of this invention to operate the gelling apparatus by power, say by an electric motor drive, and as will be clear it would be possible to employ, instead of the container 11 and piston, a power driven pump to pump the viscous alginate liquid through apertures in a plate such as is shown in Figure 4. In this case, if the gelling bath is large enough the process can be made continuous. The gelling bath can be provided with a conveyor means for continuous removal of the gelled bodies, if desired.

What we claim is:—

1. A process of manufacturing gelled bodies from solutions of the kind described characterised by maintaining a body of such solution on one face of a wall having in it an aperture, maintaining a bath of gelling liquid on the opposite face, so that a skin of gelled solution forms across the aperture, forcing the solution through the aperture to form a bag of the gelled skin which bulges into the gelling liquid and nipping off this bag while in the gelling liquid, when it has reached an appropriate size.

2. A process as claimed in Claim 1, wherein the solution to be gelled consists of sodium alginate containing sweetening and flavouring material.

3. A process as claimed in Claim 2, wherein a small quantity of tetrasodium pyrophosphate is included along with the alginate for the purpose described.

4. A process as claimed in Claim 2 or Claim 3, wherein the gelling medium consists of an organic acid, for example citric acid.

5. A process as claimed in Claim 4, wherein a small quantity of glassy sodium metaphosphate is included in the gelling bath for the purpose described.

6. Apparatus for the production of gelled bodies from solutions of the kind described consisting of a container having an aperture or apertures through

which the contents of the container may be forced, means to exert pressure on liquid in the container, a cutting-off knife or knives operating against the outside of the container over the aperture and a vessel to contain a bath of coagulating liquid and maintain it in contact with the knife and exterior of the aperture.

7. Apparatus for the production of gelled articles of the kind described substantially as described with reference to and shown in the accompanying drawing.

BOULT, WADE & TENNANT,
111 & 112, Hatton Garden, London,
E.C.1,
Chartered Patent Agents.

PROVISIONAL SPECIFICATION

Improvements in or relating to the manufacture of Artificial Fruits Gelled Pharmaceutical products and the like

We, ALGINATE INDUSTRIES LIMITED, of Walter House, Bedford Street, Strand, London, W.C.2, a British Company, do hereby declare this invention to be described in the following statement:—

This invention comprises improvements in or relating to the manufacture of artificial fruits and the like.

It is known that certain edible colloidal solutions can be gelled by immersing them into a gelling agent, and that one example of this procedure is the preparation of artificial fruits such as cherries by introducing globules of the solution into the gelling agent. For example, solutions containing sodium alginate if introduced into a solution containing a soluble calcium salt can be superficially gelled into bodies resembling fruit and if properly flavoured and coloured are satisfactory substitutes. This procedure is fully described in British Patent Specifications Nos. 556,718 and 586,157. Again if solutions containing sodium alginate and colloidal calcium phosphate prepared according to British Patent Applications Nos. 25411/50 and 25412/50 are introduced into a dilute acid used as a gelling agent similar results can be obtained. Hitherto however the usual method of operation has consisted in filling the viscous colloidal solution into moulds containing some of the gelling agent and subsequently immersing the filled mould in a bath of the gelling agent after which the moulded object is turned out of the mould into the bath. This method gives satisfactory results but to produce a continuous supply of gelled bodies needs a complicated mechanism. Another application of the procedure is in making pharmaceutical products.

According to the present invention a process of manufacturing articles of the kind described is characterised by bringing the solution to be gelled into contact with the gelling medium by extruding it through an aperture on one side of which is maintained a supply of the solution to be gelled and on the other side is the gelling medium so as to form a gelled bag around the extruded solution and thereafter nipping off the bag under the surface of the gelling medium when it has reached an appropriate size.

The nipping-off operation is conducted beneath the surface of the coagulating liquid which results in the immediate reformation of a fresh skin across the aperture so that the operation can be readily and rapidly repeated.

The invention includes an apparatus for the production of articles of the kind referred to consisting of a container having an aperture or apertures through which the contents of the container may be forced, means to force liquid out of the container through the aperture, a cutting-off knife or knives operating against the outside of the container over the aperture and means to maintain a bath of coagulating liquid in contact with the exterior of the aperture.

The following is a description by way of example of one form of apparatus in accordance with the invention and of the process according to the invention as carried out therein:—

A cylindrical container is provided, having a flat bottom and three legs which are adapted to support it in a bath of coagulating liquid so that there is a free space beneath the bottom of the container which is in contact with the coagulating liquid. In the container is a piston and through the container there passes from top to bottom co-axial with the container and piston a screw-threaded shaft. The piston fits on the screw-thread of the shaft and means are provided such as a ridge on the interior of the container fitting a groove in the edge of the piston to prevent the piston from rotating if the shaft is rotated. At the top of the container there is a yoke secured, which spans the container from side to side and affords a bearing for the upper end of the shaft. A handle is fixed to the shaft above the bearing. The shaft goes through the bottom of the container and

on the underside thereof carries a rotary cutting-off blade or blades.

Preferably, the bottom of the container is made removable and interchangeable with other bottoms, and the rotary knife blade or blades are made removable from the shaft to facilitate the changing of the bottom of the container.

The bottom of the container contains one or more apertures through which liquid from the interior of the container may be forced. The volume of the fruit-like bodies depends on the pitch of the thread, the number of apertures and the number of knives. By chosing an aperture of suitable area in relation to these three factors bodies approximating to spheres are produced.

The preparation of approximately spherical artificial fruits is described below as an example of the use of the apparatus:—

10 grams sodium alginate containing a chemical equivalent amount of colloidal calcium phosphate (as described in British Patent Applications Nos. 25411/50 and 25412/50).
5 grams sodium alginate,
500 grams sugar,
315 grams neutral glucose syrup (80% solid),

are dissolved in 300 grams of water and the mixture boiled down to a total weight of 1000 grams. Suitable colour and flavour is added and the viscous liquid is then introduced into the container of the apparatus. The gelling bath into which the container is placed is a 10% solution of citric acid.

As the shaft is rotated and fruits are cut off, the cutting-off blade carries a film of coagulating liquid across the underside of the aperture and this is immediately followed up behind the blade by a body of the coagulating liquid. The effect is to form instantaneously a fresh skin of coagulated liquid across the aperture or apertures. On the next rotation of the shaft the liquid behind the skin is forced downwards into the coagulating medium where the surface is formed into a bag. If the size of the aperture is suitably chosen in relation to the number of the apertures and the pitch of the screw-thread, and the number of knives, the bag will reach proportions in which it is somewhat deeper than a hemisphere by the next time a knife comes round. The front edge of the knife is an indented portion, so that as it crosses over the aperture it nips the sides of the bag together toward the far side of the aperture. The result is that when the bag is finally cut off it is already very nearly spherical; the sides where they are cut off form a closed bag and as the cut-off globule falls through the body of the coagulating liquid, the coagulated skin is thickened and it becomes substantially spherical. The rotation of the knife produces a fresh fruit every time it crosses an aperture, and if the cylinder has been charged with a suitable body of solution as described, the whole of this solution can be converted into fruits by screwing the shaft around until the piston reaches the bottom of the container. Thereafter the piston is returned to the top of the container again and the container recharged.

As long as the globules remain in the gelling bath the skin continues to thicken, the rate depending on the strength of the acid. The time for which they are left in the bath therefore depends on the thickness of skin desired. With a bath consisting of a 10% solution of citric acid about fifteen minutes immersion is sufficient. They have no tendency to stick together in this process and a quantity several layers deep can be accumulated in the bath. After sufficient gelling the fruits are then removed, rinsed briefly with water to remove adhering acid and spread out to dry.

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It is to be understood that the use of the apparatus as disclosed is not confined to the gelling mixture and gelling bath described in the example. For instance when gelling with an acid the proportion of sodium alginate and insoluble calcium salt in the mixture to be gelled can be varied within wide limits. If a gelling bath containing a soluble calcium salt is used, the mixture to be gelled will contain sodium alginate, but need not contain any calcium.

A solution of any edible acid can be used as an acid setting bath. Approximately normal acid gives good results but the concentration can be varied widely.

It is to be understood further that the use of the apparatus is not confined to the preparation of artificial fruits as described in the example. It can also be used for other preparations where a gelling mixture is gelled by contact with a

suitable gelling bath. An example of another use is the preparation of gelled globules for pharmaceutical purposes.

Dated this 17th day of December, 1951.
BOULT, WADE & TENNANT,
111 & 112, Hatton Garden, London, E.C.1,
Chartered Patent Agents.

Leamington Spa: Printed for Her Majesty's Stationery Office, by the Courier Press.—1955.
Published at The Patent Office, 25, Southampton Buildings, London, W.C.2, from which copies may be obtained.

727,475 COMPLETE SPECIFICATION
1 SHEET

This drawing is a reproduction of the Original on a reduced scale.

Fig. 1.

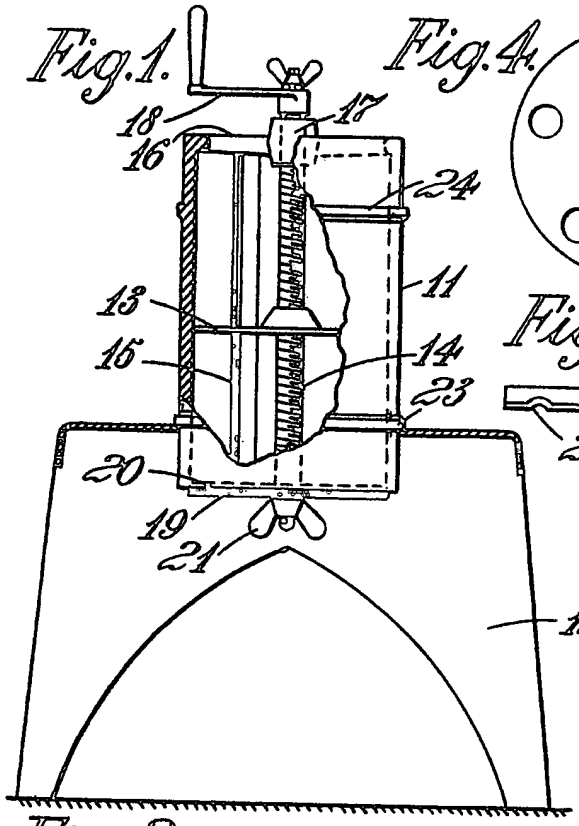

Fig. 4.

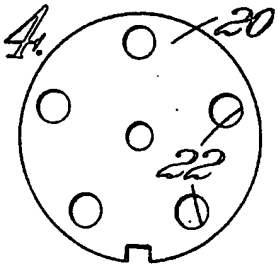

Fig. 5.

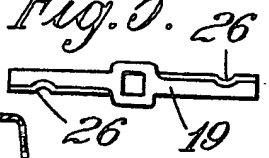

Fig. 2.

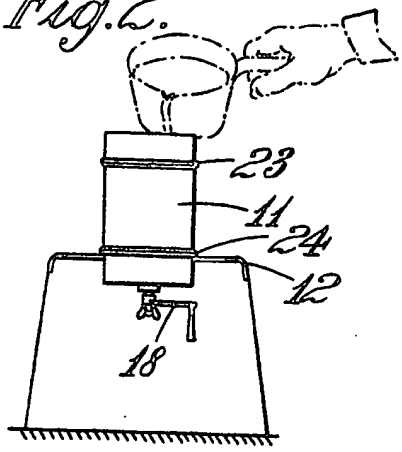

Fig. 3.